

**ABSTRACT:**

An apparatus for carrying out a multi-step process of converting hydrocarbon fuel to a substantially pure hydrogen gas feed includes a plurality of modules stacked end-to-end along a common axis. Each module includes a shell having an interior space defining a passageway for the flow of gas from a first end of the shell to a second end of the shell opposite the first end, and a processing core being contained within the interior space for effecting a chemical, thermal, or physical change to a gas stream passing axially through the module. the multi-step process includes: providing a fuel processor having a plurality of modules stacked end-to-end along a common axis; and feeding the hydrocarbon fuel successively through each of the modules in an axial direction through the tubular reactor to produce the hydrogen rich gas.